

## Claims

- [c1] 1.A method for acquiring image data from a subject during a scan with a Magnetic Resonance Imaging (MRI) system comprising:  
acquiring a reference data set of a region of interest;  
acquiring a plurality of free-breathing data sets of said region of interest; and,  
selectively processing said plurality of free-breathing data sets in comparison with said reference data set for use in generating an image of said region of interest.
- [c2] 2.The method of claim 1 wherein said reference data set is a breath-held data set.
- [c3] 3.The method of claim 2 further comprising the step of reconstructing said breath-held data set.
- [c4] 4.The method of claim 1 wherein said reference data set is selected from the free-breathing data sets.
- [c5] 5.The method of claim 1 wherein the region of interest is a coronary artery.
- [c6] 6.The method of claim 1 wherein said selectively processing step comprises comparing each respective acquisition of said plurality of free-breathing data sets at a given interleaf angle with a corresponding acquisition of said reference data set at said given interleaf angle to produce a plurality of matched acquisitions for said given interleaf angle.
- [c7] 7.The method of claim 1 further comprising the steps of reconstructing said respective acquisitions of each of said reference and free-breathing data sets into respective complex sub-images for use in said comparing step.
- [c8] 8.The method of claim 1 wherein said comparing step comprises two-dimensional (2D) cross-correlation.
- [c9] 9.The method of claim 6 further comprising averaging a predetermined number of said matched acquisitions for use in generating said image of said region of interest.

- [c10] 10.The method of claim 1 wherein said each of said respective reference and free-breathing data sets are acquired by spiral trajectory scanning having an Archimidean spiral.
- [c11] 11.The method of claim 1 wherein said each of said respective reference and free-breathing data sets are acquired by spiral trajectory scanning having a modified spiral that samples the center of k-space more densely than the outer portion of k-space.
- [c12] 12.The method of claim 1 wherein said respective reference and free-breathing data sets comprise a plurality of slices of a multi-slice data set.
- [c13] 13.A method for acquiring image data from a subject during a scan with a Magnetic Resonance Imaging (MRI) system comprising:  
acquiring a breath-held image data set of said region of interest with spiral scanning;  
acquiring a plurality of free-breathing data sets of said region of interest with spiral scanning;  
comparing respective interleaves from said breath-held data set at a given interleaf angle with respective corresponding interleaves of said plurality of free-breathing data sets at said given interleaf angle to select a predetermined plurality of matched interleaves from said free-breathing data sets; and,  
averaging said predetermined plurality of matching interleaves for use in generating an image of said region of interest.
- [c14] 14.The method of claim 13 wherein said respective breath-held and free-breathing data sets comprise a plurality of acquisitions at a plurality of interleaf angles in a spiral trajectory.
- [c15] 15. The method of claim 14 further comprising repeating said comparing step for each interleaf angle of said spiral trajectory.
- [c16] 16.The method of claim 13 wherein said region of interest is a coronary artery.
- [c17] 17.The method of claim 13 wherein said each of said respective breath-held

and free-breathing data sets are acquired by spiral trajectory scanning having a Archimidean spiral.

[c18] 18.The method of claim 13 wherein said each of said respective breath-held and free-breathing data sets are acquired by spiral trajectory scanning having a modified spiral that samples the center of k-space more densely than the outer portion of k-space.

[c19] 19.A method of acquiring and reconstructing an image of a dynamic region of interest using a Magnetic Resonance Imaging (MRI) system comprising:  
acquiring a reference data set of said region of interest using spiral trajectory scanning;  
reconstructing each respective spiral interleaf of said reference data set for each interleaf angle of said spiral trajectory into respective complex reference sub-images;  
acquiring a plurality of free-breathing data sets of said region of interest using spiral trajectory scanning;  
reconstructing each respective spiral acquisition of said plurality of free-breathing data sets at for each interleaf angle of said spiral trajectory into corresponding free-breathing complex sub-images;  
comparing said respective breath-held and corresponding free-breathing complex sub-images to select matching acquisitions for each interleaf angle from said free-breathing data sets; and,  
averaging said matching acquisitions at each interleaf angle; and,  
assembling and summing said averaged matching acquisitions to generate an image of said region of interest.

[c20] 20.The method of claim 20 wherein said region of interest is a coronary artery.

[c21] 21.The method of claim 20 wherein said each of said respective breath-held and free-breathing data sets are acquired by spiral trajectory scanning having a Archimidean spiral.

[c22] 22.The method of claim 20 wherein said each of said respective breath-held

and free-breathing data sets are acquired by spiral trajectory scanning having a modified spiral that samples the center of k-space more densely than the outer portion of k-space.

- [c23] 23. A method for acquiring image data from a subject without breath-holding during a scan with a Magnetic Resonance Imaging (MRI) system comprising: acquiring a reference data set of a region of interest during free-breathing; acquiring a plurality of additional free-breathing data sets of said region of interest; and, selectively processing said plurality of additional free-breathing data sets in comparison with said reference data set for use in generating an image of said region of interest.
- [c24] 24. The method of claim 23 wherein said step of acquiring said reference data set comprises randomly selecting a reconstructed free-breathing data set.
- [c25] 25. The method of claim 24 further comprising the step of adjusting respective positions of said additional free-breathing data sets relative to said randomly selected reconstructed free-breathing data set.